

SUPERFUND TREATABILITY CLEARINGHOUSE

Document Reference:

Detox Industries, Inc. "Work Plan for Biodegradation of Poly-Chlorinated Biphenyls (PCBs) at a Superfund Site." Technical report of three volumes with a total of about 20 pages and related correspondence. Work plan prepared for General Motors Corporation, Massena, New York. September 1986.

EPA LIBRARY NUMBER:

Superfund Treatability Clearinghouse - FCQP



SUPERFUND TREATABILITY CLEARINGHOUSE ABSTRACT

Treatment Process: Biological - Aerobic

Media: Sludge/Generic

Document Reference: Detox Industries, Inc. "Work Plan for Biodegradation of Poly-Chlorinated Biphenyls (PCBs) at a Superfund Site." Technical report of three volumes with a total of about 20 pages and related correspondence. Work plan prepared for General Motors Corporation, Massena, New York. September 1986.

Document Type: Contractor/Vendor Treatability Study

Contact: Melvin Hauptman
U.S. EPA - Region II
Emergency & Remedial Response Division
26 Federal Plaza
New York, NY 10278
212-264-7681

Site Name: Massena, NY (NPL)

Location of Test: Hearne Utilities, Hearne, TX

BACKGROUND: This document is composed of a work plan and additional technical information which demonstrates the qualifications of Detox Industries, Inc. to conduct remediation of a PCB contaminated sludge at General Motors (GM) plant in New York. Provided are the results of a field demonstration conducted on sludge containing PCB at Hearne Utilities in Hearne, TX. Bench-scale biodegradation studies were also conducted by Detox Inc. on samples of sludge provided by GM from their Massena, NY site. Significant reductions in PCB levels were noted in the tests.

OPERATIONAL INFORMATION: The technical summary provided by Detox Industries, Inc. provides a description of a field test conducted on approximately 500 lbs. of a PCB contaminated sludge at the Hearne Utility site in Hearne, Texas. The sludge was placed into a non-leaking bioreactor open to ambient air. PCB transformer oil was added to the sludge to bring the total PCB concentration to approximately 2000 ppm. The mixture was stirred constantly to ensure aerobic conditions and microbes and nutrients were added to the reactor. Testing time was approximately two months (September 83 - December 83). Samples were provided to NUS Laboratories in Houston, Texas for PCB analysis.

Bench tests were conducted by Detox Industries, Inc. on PCB contaminated sludge samples provided by General Motors from their site in Massena, New York. Samples were inoculated with microorganisms and agitated in a water bath for 16 days. Aliquots were taken and sent to Southwestern Laboratories for PCB analysis.

The technical summaries provided very few details on the microbes that Detox Industries, Inc. has developed for the biodegradation of PCB other than generic statements indicating that oxygen, moisture and nutrients must

be present for the process to occur and that Detox Industries microbes are not affected by PCB. The work plan refers to QA/QC procedures, but they are not included in the plan.

PERFORMANCE: The field test at Hearne, Texas showed a significant reduction of PCB from the initial concentration at 2000 ppm. Final concentrations were as low as 0.12 ppm PCB. Results of bench scale tests of samples of PCB contaminated sludge taken from the GM site in New York also showed reductions in PCB levels. Table 1 shows the results after 16 days of treatment.

Results of the various studies revealed that the Detox Industries, Inc. biodegradation process reduced PCB levels in contaminated materials. The U.S. EPA approved the GM request to conduct a full-scale pilot study of this process at the GM site in Massena, New York.

CONTAMINANTS:

Analytical data is provided in the treatability study report. The breakdown of the contaminants by treatability group is:

<u>Treatability Group</u>	<u>CAS Number</u>	<u>Contaminants</u>
W02-Dioxins/Furans/PCBs	1336-36-3	Total PCBs

TABLE 1

PCB (1248) BIODEGRADATION

	<u>Untreated Soil</u>	<u>Treated Soil</u>	<u>% Reduction</u>
GM Lagoon #1	338 ppm	107 ppm	68.3
GM Digester	110 ppm	63 ppm	42.7
GM Activated Sludge	63 ppm	6.5 ppm	89.6

Notes: a) Treatment time - 16 days
b) This is a partial listing of data. Refer to the document for more information.



Division of General Motors Corporation
Massena Plant
Post Office Box 460
Massena, New York 13662

October 7, 1986

Certified Mail -
Return Receipt
Requested

Chief, Site Investigation & Compliance Branch
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
26 Federal Plaza
New York, N.Y. 10278

Attn: GM Foundry Project Coordinator
Mr. Melvin Hauptman, P.E.

Dear Mr. Hauptman:

This is a request for EPA's approval of GM's conducting a Biological Degradation of PCBs at this Superfund Site.

GM plans to have Detox Industries, Inc. conduct the biodegradation of PCBs in accordance with the attached Work Plan. The first phase will be the treatment of approximately 300,000 gallons of sludge and soil as described in the Work Plan. This request for approval concerns this first phase only. When the first phase is completed, GM will determine whether additional phases are appropriate and, if so, we will make a separate request for EPA's approval.

GM and Detox are in the position to initiate this project as soon as EPA's approval is received.

Should you or your staff have any questions regarding this matter, please contact me at (315) 764-2233.

Sincerely,

D. P. Fayette
G. M. Facility Coordinator

Encl.

xc: Chief, Waste and Toxic Substances Branch
Office of Regional Counsel
U. S. Environmental Protection Agency
Room 437 - 26 Federal Plaza
New York, New York 10278
Att: G. M. Foundry Attorney

Director, Division of Solid and Hazardous Waste
New York State Dept. of Environmental Conservation
Room 207 - 50 Wolf Road
Albany, N. Y. 12233

Mr. Randy Hart
St. Regis Mohawk Health Service
Community Building
St. Regis Mohawk Reservation
Hogansburg, N.Y. 13655

U. S. Environmental Protection Agency
Region II
Woodbridge Avenue
Building 209
Edison, New Jersey 08817

Att: Ms. Diana Messina

Mr. Darrell Sweredoski
Sr. Sanitary Engineer
Division of Solid and Hazardous Waste
New York State Department of
Environmental Conservation
Region 6
317 Washington St.
Watertown, N. Y. 13601

W O R K P L A N

FOR

Biodegradation of Polychlorinated Biphenyls (PCBs)
at
a Superfund Site

GENERAL MOTORS CORPORATION
Massena, New York

D E T O X I N D U S T R I E S , I N C .

12919 Dairy Ashford
Sugar Land, TX 77478
(713) 240-0892

9/30/86

I.

OPERATIONAL PLAN TO BIOLOGICALLY
TREAT PCBs ON SITE

1. Project Objectives

DETOX INDUSTRIES, INC. ("Detox") proposes to construct a 24' high and 56' diameter open steel tank to which 300,000 gallons, more or less, of PCB contaminated sludges and/or soils will be gathered from an existing 350,000 gallon capacity lagoon located on property owned by General Motors Corporation located in Massena, New York. Such sludges and/or soils shall be treated in phases of 300,000 gallons minimum at the site in the tank. Its purpose is to reduce the PCB contamination level of the above material to less than 2 ppm to be reported on an "as received" basis or any higher level concentration agreed to by EPA Region II. Said tank will be the property of Detox and will be removed at the expense of Detox within one (1) year of completion of the project.

2. Scope of Work:

The work to be performed consists of the following tasks:

- 2.1 Detox will place into the tank (bioreactor) approximately 300,000 gallons of contaminated sludge from the GM lagoon. A minimum of a two-foot freeboard will be maintained to prevent any overflowing.

- 2.2 A mixing (i.e., diffusion) device will be placed into the tank to ensure mixing of the sludge.
- 2.3 After twenty-four hours of mixing, two one-quart samples will be taken, coded, sealed and properly stored with chain-of-custody forms for transmittal to a third party laboratory for PCB analysis to be reported on an "as received" basis. These samples will represent the background "untreated" samples.
- 2.4 Detox's proprietary nutrients will be added to start the PCB biodegradation process. Detox's microorganisms will then be inoculated into the mixture. (Timely addition of nutrients and microorganisms will be made by Detox to ensure the rate of degradation.)
- 2.5 Two one-quart samples will be removed from the tank for total PCB analysis each Monday during the biodegradation process. These samples will be treated exactly as in Task 2.3. All samples will be sent to a third party laboratory for total PCB analysis to be reported on an "as received" basis.
- 2.6 All samples will be secured in the presence of a GM representative designated in writing by GM.
- 2.7 All samples shall be treated by Detox with a biocide designated in writing to GM for the purpose of destroying Detox's proprietary microorganisms. The quantity of said biocide added to each sample shall be prescribed in such writing.

2.8 Tasks 2.4 through 2.7 will be repeated until the PCB contamination level of the samples has been reduced to the greater amount of 2 ppm or such higher concentration level as may be acceptable to EPA Region II.

2.9 After the PCB contamination level has been reduced in accordance with Task 2.8 above, the tank contents will be removed to a location on the GM property as designated by GM not further than 500 feet from the original lagoon.

3. Performance Schedule:

Based on past projects conducted by Detox involving similar contaminated sludges, the project is estimated to be completed within a six-month period.

4. Volumetric Determination

Materials (sludges and/or soils) to be treated shall be measured on the basis of input as follows:

- (a) Sludges - volume shall be measured with a flow-meter designed to quantify the amount of through-put.
- (b) Soils - volume shall be measured from an elevation benchmark through each phase of excavation.

II.

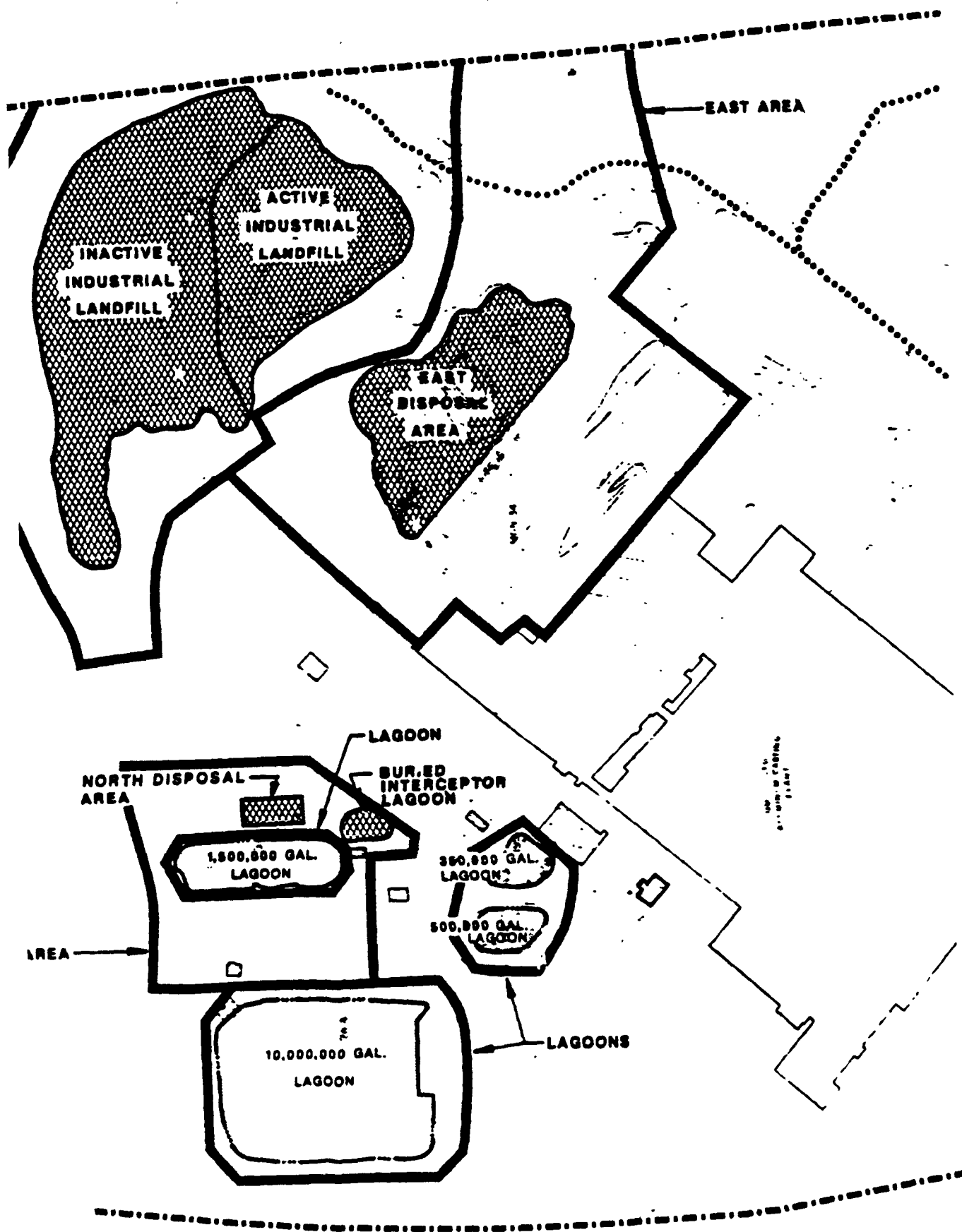
WASTE DESCRIPTION

DESCRIPTION

300,000 gallons, more or less, of sludge contaminated with polychlorinated biphenyls (PCBs) in excess of 2 ppm to a depth of approximately six (6) feet (plus an undetermined amount of similarly contaminated soil beneath the sludge to a depth of approximately forty (40) feet) contained in and under a 350,000 gallon capacity lagoon located at the General Motors Corporation, Central Foundry Division, Massena Plant in Massena, New York as indicated in the attached site plan. Said Material shall not include any object exceeding one (1) inch in diameter.

?uby

MASSENA SITE PLAN



III.

SAMPLING PROCEDURES

PROPOSED PROTOCOL

Sampling Initial Stage

1. From the bioreactor and under the proper chain-of-custody, two one-quart split samples of contaminated material will be taken randomly after twenty-four hours of mixing. These samples will be analyzed by a third party laboratory for total PCBs by Gas Chromatograph (GC) to establish an analytical benchmark for performance evaluation. The concentration levels of PCBs in samples are to be reported on an "as received" basis.

Subsequent Sampling Stages

2. Two one-quart samples will be taken under chain-of-custody procedures at 12 o'clock noon each Monday on a weekly basis for duration of the project and shipped to a third party independent test laboratory for GC analysis in the same manner as that for all previous samples.

All Sampling

3. All samples taken in steps 1 and 2 above shall be taken in the presence of a GM representative designated in writing to Detox and shall be transmitted to the laboratory pursuant to chain of custody procedures designated by EPA Region II.

IV.

ANALYTICAL PROCEDURES

Samples will be analyzed in accordance with EPA Method 8080, "Organochlorine Pesticides and PCBs, in Test Methods for Evaluating Solid Waste , SW 846, 2d Edition, July 1982".

Analytical results will be reported on an "as received" basis. GM shall pay the cost of analysis. The third party laboratory hired by GM must be acceptable to Detox and EPA. All laboratory reports shall be delivered to GM and Detox separately by the laboratory. In addition, the laboratory shall deliver all gas chromatograms to Detox.

V.

DATA REPORTING/RECORDKEEPING

Detox Industries plans to keep records of the following:

1. Daily*
 - Records of bioreactor temperature
 - Log of activities
 - Operational parameters
 - Visitors
 - Weather
 - Shutdowns, spills, accidents
 - Notifications
2. Weekly*
 - Sample description, location, chain-of-custody
 - Third party laboratory results (notification)

* All records/books (on site) open to GM and EPA inspection.

VI.

SPILL PREVENTION

Spill prevention is directly addressed by the following considerations:

1. The process will be applied in a manufactured open steel tank. Rupture of these standard tanks is considered relatively non-existent.
2. A containment berm is to be constructed completely around the process facility to act as an impediment to any extraneous flow of material created in an emergency situation.
3. Should an emergency occur, spilled material will be placed back into the tank along with any extra material which becomes contaminated through a spill or rupture.
4. Any spill will be reported to GM immediately. GM is responsible for reporting to the government, as necessary.

VII.

SAFETY PLAN

Detox Industries, Inc.'s safety plan insures that each employee has been properly instructed in the use of a wide variety of safety equipment including, but not limited to, the following:

- **Protective Clothing**
- **Face Shields, Protective Gloves**
- **Respirators**
- **Emergency Personnel Wash**
- **First Aid**

VIII.

TRAINING PLAN

Detox personnel previously trained in handling parameters of Detox process.

All training performed in Detox's Houston facilities.

IX.

QUALITY ASSURANCE PLAN

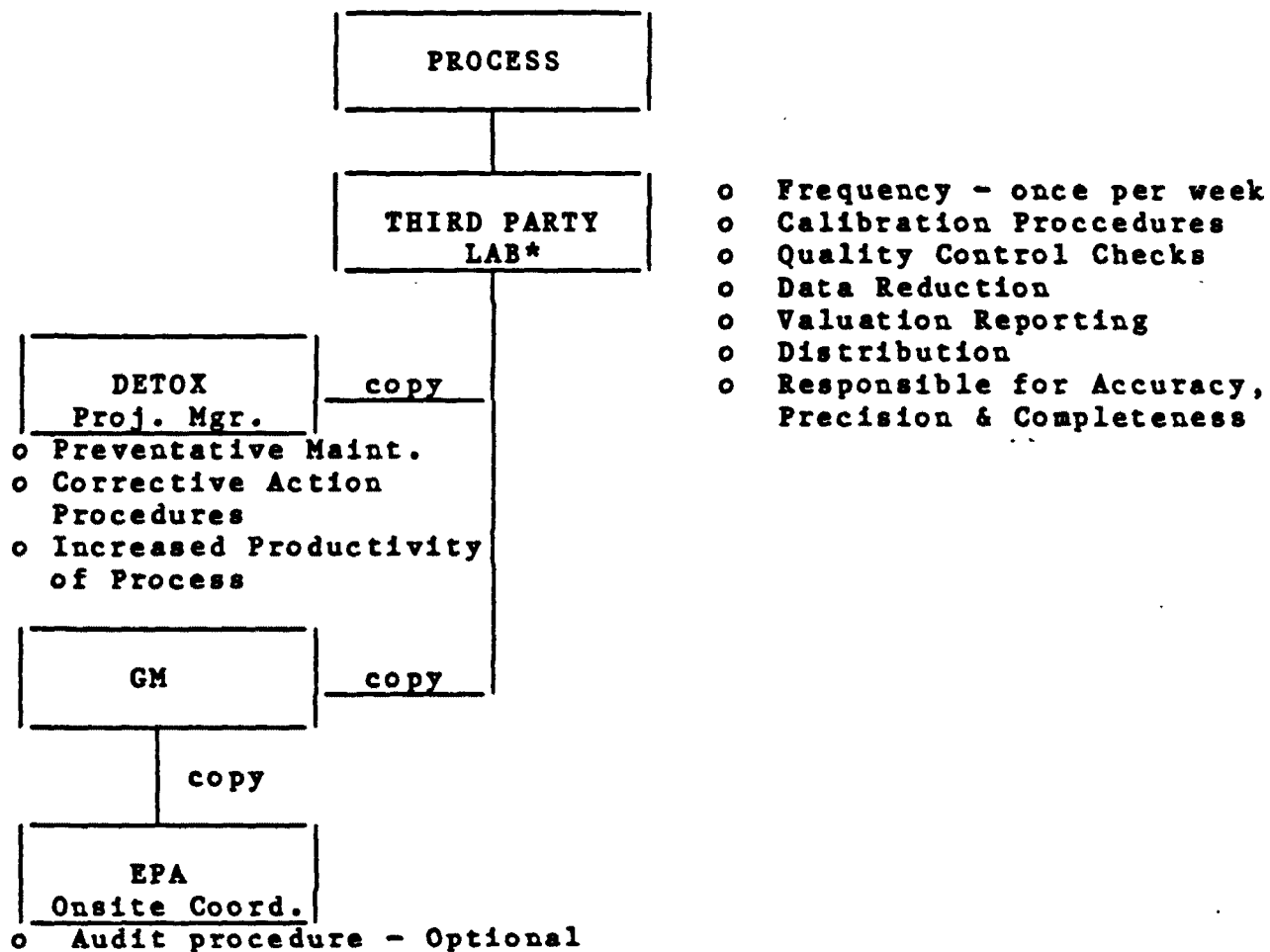
Detox's biodegradation is a new alternate destruction technology for PCBs.

Quality assurance for analytical work is the responsibility of the third party laboratory as such laboratory will be doing all sample monitoring and analysis.

MEASUREMENT VERIFICATION

PCB analysis. (See next page for flowchart.)

MEASUREMENT VERIFICATION (Cont.)



* Using all EPA standard operating procedures and analytical calculations.

26 MAY 1987

CERTIFIED MAIL-
RETURN RECEIPT REQUESTED

Mr. David P. Fayette
G.M. Facility Coordinator
Central Foundry Division
General Motors Corporation
P.O. Box 460
Massena, New York 13662

Re: G.M. Central Foundry

Dear Mr. Fayette:

This is in response to your letter of October 7, 1986 requesting the Environmental Protection Agency (EPA) approval for G.M. to treat some of the wastes at the above-captioned site through biological degradation using the Detox Industries (Detox), Inc. process. EPA has reviewed this request and the work plan for this undertaking in great detail. The treatment you have proposed appears to have the potential for being an effective and economic means for dealing with the PCB materials at the site. We have determined that, subject to the conditions set forth below, G.M.'s proposal should be carried out as a field-scale pilot study examining the effectiveness of the process.

EPA will consider the Detox process under the Treatability Study task in the Remedial Investigation/Feasibility Study (RI/FS) currently being conducted by G.M. under the EPA Administrative Order. Task 11 was an optional task in the September 1984 EPA Work Plan for the RI/FS and it called for "pilot or bench-scale treatability studies" to evaluate remedial actions applicable to the contaminated media at the site. The necessary modifications to the work plan are as follows.

1. We do not understand the reason for excavating the contents of the lagoon down to "approximately forty (40) feet" as described in Section II. Waste Description; please explain this.
2. We require analysis for each PCB arochlor on a monthly basis as well as for New York State regulated non-hazardous industrial wastes, i.e. oils and greases.
3. We require complete hazardous substance/hazardous waste characteristics (priority pollutant and non-hazardous industrial waste) analyses of the liquid and solids at the conclusion of the six month effort.
4. Because the lagoon contains volatile organic contaminants along with the PCBs, we require monthly air monitoring for volatile organic priority pollutants immediately downwind of the reactor vessel to assure that no applicable State or Federal air quality standards are violated.

5. The water supernatant remaining in the 300,000 gallon treatment tank after the 6 month treatment period may be allowed to be passed through the existing G.M. wastewater treatment facility. This decision will be made jointly by New York State and EPA after reviewing the analytical results of the supernatant.
6. The solids remaining in the treatment tank after the 6 month time period may have to be handled as hazardous waste or non-hazardous industrial wastes under New York State regulations. A decision as to the ultimate disposition of these solids will also be made jointly by New York State and EPA at that time.
7. At the conclusion of the six month treatment period, G.M. shall submit to EPA a Final Report containing descriptions of the activities which have taken place, the sampling and analysis data, quality assurance/quality control reports for the data, volumetric information on the starting and remaining materials, and a discussion on the performance ability of the process to detoxify PCBs.
8. G.M. is to supply in the Final Report, capital investment and operational costs associated with this process. This information may subsequently be used in the Feasibility Study for the entire G.M. site. The parameters necessary for the cost-effectiveness analysis required by §300.68 of the National Contingency Plan are to be included in the Final Report.

We look forward to this undertaking and apologize for the extended time necessary for our decision.

Sincerely yours,

John V. Czapor, Chief
Site Compliance Branch

cc: Leonard F. Charla, G.M.
Joe Chu, G.M.
Randy Hart, St. Regis Mohawk Health Services
Norman N. Nosenchuck, NYSDEC
Ward Stone, NYSDEC
Darrell Sweredoski, NYSDEC
Gary Litwin, NYSDOH

bcc: Carol Casazza, ORC

ROUTING AND TRANSMITTAL SLIP

Date 10/21/86

TO: (Name, office symbol, room number, building, Agency/Post)		Initials	Date
1.	Mr Hauptman		
2.			
3.			
4.	Jim Saker, EPA, R6, (214) 767-9899		
5.	Tom Pfeiffer, HQ, 382-4477		

Action	File	Note and Return
Approval	For Clearance	Per Conversation
<input checked="" type="checkbox"/> As Requested	For Correction	Prepare Reply
Circulate	<input checked="" type="checkbox"/> For Your Information	See Me
Comment	Investigate	Signature
Coordination	Justify	

REMARKS

For more on Region 6's experience call:
 Stan Hitt, Region 6
 Chief, Texas Remedial Section
 729-0383
 (he was very helpful and talkative) on this

DO NOT use this form as a RECORD of approvals, concurrences, disposals, clearances, and similar actions

FROM: (Name, org. symbol, Agency/Post)	Room No.—Bldg.
Glenn	Phone No.

5041-102

U.S.G.P.O.: 1985-461-274/428

OPTIONAL FORM 41 (Rev. 7-78)
 Prescribed by GSA
 FPMR (41 CFR) 101-11.206

DETOX INDUSTRIES, INC.

4800 SUGAR GROVE BLVD.
SUITE 210
STAFFORD, TEXAS 77477
(713) 240-0892

January 7, 1986

Mr. David P. Fayette
Sr. Plant Engineer
Central Foundry Division
GENERAL MOTORS CORPORATION
P.O. Box 460
Massena, New York 13662

Dear Mr. Fayette:

This letter is to confirm our telephone conversation of last week whereby we discussed our successful feasibility study conducted on PCB samples sent to us by you from the Massena Plant.

Enclosed for your review is a laboratory report from Southwestern Laboratories of Houston, Texas. This report is dated January 6, 1986 reporting analyses of three (3) samples provided by you. Each of the three samples received from you was separated into a control and a sample to be treated. The treated samples were inoculated with our naturally occurring microorganisms on November 27, 1985 and placed on a water bath shaker to cause agitation. Aliquots of each control and treated sample were removed for laboratory analysis of PCBs on December 11, 1985. The following is a recapitulation of that analysis:

	<u>Control (untreated)</u>	<u>Treated</u>	<u>% Reduction</u>
GM Lagoon #1	338 ppm (1248)	107 ppm	68.3%
GM Digester	110 ppm	63 ppm	42.7%
GM Activated Sludge	63 ppm	6.5 ppm	89.6%

The above analyses represent comparisons of the contaminated samples sent to us before and after treatment with our process. They demonstrate a significant reduction in PCB contamination after only sixteen (16) days of treatment by our biological process. Consequently, we are confident that our process may be successfully applied to the sites from which each sample was

Mr. David P. Fayette
January 7, 1986
Page Two

provided to reduce the contamination level to a very low concentration. As discussed, application of our process to the contaminated sludge may be expected to ultimately result in water and sediment relatively uncontaminated for all practical purposes.

We hope you are as excited about the above results as we are. We look forward to the possibility of using our technology to solve your disposal dilemma and hope to hear from you soon.

Thank you for giving us the opportunity to demonstrate the effectiveness of our preferred disposal alternative.

Sincerely yours,



Thomas A. Dardas

cc: Dr. J. Chu
Mr. J. Medved

TAD/mec
Enclosure

980-TS1-RT-FCQP



Division of General Motors Corporation
Massena Plant
Post Office Box 460
Massena, New York 13662

October 31, 1986



Certified Mail-
Return Receipt
Requested

Chief, Site Investigation & Compliance Branch
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
26 Federal Plaza
New York, N.Y. 10278

Attn: G.M. Foundry Project Coordinator
Mr. Melvin Hauptman, P.E.

Dear Mel:

Enclosed you will find a copy of the letter and Laboratory Report from Detox Industries, Inc. dated January 7, 1986. As we discussed during last Wednesday's meeting, the test run times were limited to 16 days duration. It should also be noted that the report details samples taken from three (3) areas of the Plant, the 350,000 gallon lagoon is listed as GM Lagoon #1, the remaining two samples were selected as areas that might be beneficial to the plant operation should the process prove viable.

If there are any questions concerning this matter, please contact me at 315-764-2233.

Sincerely,

A handwritten signature in cursive script, reading "D. P. Fayette".

David P. Fayette
G.M. Facility Coordinator

cc: Joseph P. Chu, PhD, P.E.



SOUTHWESTERN LABORATORIES

001001

Materials, environmental and geotechnical engineering, nondestructive, metallurgical and analytical services

222 Cavalcade St. • P.O. Box 8768, Houston, Texas 77249 • 713/692-9151

File No. 2-1787-00

Report No. 7344-7355

Report Date 1/6/86

DeTox Industries, Inc.
Gene Liner
4 Sugar Grove, Suite 210
4800 Sugar Grove Boulevard
Stafford, Texas 77477

Analysis of samples submitted 12/12/85 by Gene Liner.

RESULTS

<u>Sample I.D.</u>	<u>SWL Lab No.</u>	<u>DDT, ppm</u>	<u>PCB, ppm</u>
Baker 58055, Control	7344	3965	
Baker 58196, Control	7345	117	
Baker 58055, Treated	7346	2391	
Baker 58196, Treated	7347	110	
GM-Lagoon #1, Control	7348		338 as 1248
GM-Digester, Control	7349		110 as 1248
GM-Activated Sludge, Control	7350		63 as 1248
GM-Lagoon #1, Treated	7351		107 as 1248
GM-Digester, Treated	7352		63 as 1248
GM-Activated Sludge, Treated	7353		6.5 as 1248
GM-(IND)-E-3, Treated 8/27	7354		8253 as 1242
GM-(IND), Treated 8/18	7355		4107 as 1242

SOUTHWESTERN LABORATORIES

n:

3 - DeTox Industries, Inc.

pm


Chris Barry
Chemist

and reports are for the exclusive use of the client to whom they are addressed. The use of our name must receive our prior written approval. Our letters apply only to the sample tested and/or inspected, and are not necessarily indicative of the quantities of apparently identical or similar products.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
INTERFIRST TWO BUILDING, 1201 ELM STREET
DALLAS, TEXAS 75270

August 15, 1984

Mr. Thomas A. Dardas, President
Detox Industries, Inc.
Four Sugar Grove, Suite 210
4800 Sugar Grove Blvd.
Stafford, Texas 77477

Dear Mr. Dardas:

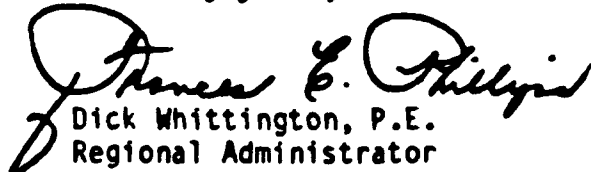
This letter responds to the application submitted by Detox Industries requesting approval by the Regional Administrator of the U.S. Environmental Protection Agency, Region VI for the use of its biological disposal method for the destruction of polychlorinated biphenyls (PCBs) in Region VI States. EPA hereby grants the requested approval subject to the enclosed conditions and based upon the results of a demonstration Detox conducted on PCB contaminated wastes. Split samples were collected by EPA before and after the test period.

Section (6)(e) of the Toxic Substances Control Act (TSCA) requires EPA to control the disposal of PCBs. EPA promulgated regulations in Title 40 Code of Federal Regulations, Part 761 to implement Section (6)(e). These regulations provide that disposal of PCBs in concentrations of 50 parts per million or greater shall be by methods approved by the Regional Administrator of the EPA Region in which the method is to be used. Detox has requested by its application of 12/17/82, that its PCB biological disposal method be approved in accordance with EPA PCB disposal regulations.

Violation of 40 CFR Part 761 or any condition included as part of this approval may subject Detox to enforcement action under the appropriate statute and/or termination, revocation or modification of the approval. Furthermore, receipt of evidence that (1) a misrepresentation of any material fact has been made in any Detox submittal; (2) all relevant facts have not been disclosed; (3) the nature of the disposal process has substantially changed from the effective date of this approval; or, (4) Detox is found to be in non-compliance with its approval conditions shall constitute sufficient cause for revocation or modification of this approval.

This approval shall be effective upon receipt of this letter.

Sincerely yours,


Dick Whittington, P.E.
Regional Administrator

Enclosure

**Conditions for PCB Disposal by the Detox Industries
Biological Degradation Technology**

1. Before disposal of any PCBs by the Detox biological disposal method, except for up to a 3 gallon sample for testing or demonstrating the process, Detox and the owner of the PCB waste material (applicant) shall make written request to the EPA Region VI Regional Administrator for approval to dispose of PCBs. A copy of the notification shall be sent to the appropriate State and local officials. PCBs in concentrations at or over 500 parts per million (ppm) are required to be incinerated by the PCB regulations. For sites with PCB concentrations of 500 ppm or greater, Detox and the applicant shall request from the Regional Administrator an exemption from the incineration requirements of 40 CFR 761.70.

Detox may test or demonstrate the ability of its process to degrade an applicant's PCB waste without EPA approval on one sample not to exceed three gallons. Disposal of the sample after testing is completed shall be according to applicable federal and/or State regulations. EPA may request additional information or add additional requirements to complete its evaluation of the disposal project. Detox and the applicant must receive written approval from the Regional Administrator before disposal can begin. The Regional Administrator may add other conditions to the approval that are not in this general approval.

Detox and the applicant shall attach to the written request a report which shall contain the following information:

- (a). A report detailing the extent of surface and sub-surface PCB contamination in soil and/or presence or movement in the groundwater, and identification of hazardous wastes which may be present as defined by 40 CFR Part 261 of the Resource Conservation and Recovery Act (RCRA). This report shall include a "Background" section describing how the PCB contamination occurred and showing the range in concentration of PCBs (and hazardous wastes if present), and the total contaminated waste volume. This report shall be compiled from representative samples from the waste material and analyzed according to methods acceptable to EPA.
- (b). A waste disposal plan showing the following:
 - (1). How access shall be controlled during the disposal period.
 - (2). A runoff/run-on control plan showing how potential losses of PCBs from the contaminated area shall be controlled.
 - (3). If groundwater contamination exists, what are the plans for groundwater decontamination, groundwater monitoring, and/or remedial action for groundwater decontamination/control after disposal is completed. If groundwater is not contaminated, how the groundwater will be protected from PCB contamination.

- (4). The approximate length of time required for PCB disposal, and the expected level of treatment the biological process is expected to achieve. Included in this part shall be a discussion of the number of expected microbial applications; types of organisms to be used; nutrient applications; type and amount of emulsifier to be applied, if any; soil type and conditions such as pH; and what factors are expected to influence the disposal process, either positively or negatively, to achieve final treatment.
 - (5). A proposal for monitoring and reporting the progress during the PCB disposal. Periodic reporting shall be required based upon the length of time projected for PCB disposal. Monitoring of the project shall be required to ensure that the waste materials are properly handled during the disposal process.
 - (6). A Quality Assurance (QA) Plan shall be submitted detailing the sampling plan, sampling protocols, and the Analytical Quality Assurance/Quality Control (QA/QC) during the disposal period. The name, address, and contact person for the analytical laboratory shall be submitted. EPA may disapprove the proposed laboratory.
 - (7). A contingency plan showing where the PCB contaminated waste will be taken for proper final disposal if the PCB concentration is not reduced to below 2 ppm.
- (c). A plan for final disposition of the waste material. This plan shall show where the treated waste shall be sent if moved from the original site of contamination. Whether or not the waste material is planned to be moved, a closure plan and post closure plan shall be submitted for the site of contamination.
2. PCBs shall be treated to a concentration less than 2 parts per million (ppm). Detox or the applicant may request a different final level of treatment by providing justification to the Regional Administrator. Failure to meet the 2 ppm PCB concentration may require removal to a hazardous waste landfill approved to receive such wastes in accordance with RCRA, Subtitle C; a landfill approved pursuant to TSCA Section 6(e) to receive PCB wastes; or, an incinerator approved to receive PCB wastes pursuant to TSCA Section 6(e).

3. Detox and the applicant shall identify and obtain all required state, local, and federal permits, approvals, and/or authorizations before disposal can begin.
4. Records and data shall be maintained on the proceedings at each disposal site. Data shall include: (a), the name and address of the company or individual for whom the service was performed; (b), name and telephone number of contact person for the company; (c), the location and dates service was performed; (d), the amount of PCB waste treated; (e), a copy of the gas chromatograph and/or data record from analysis of representative samples taken before, during, and after PCB disposal.

EPA may require additional samples and analyses for PCBs or for the presence of other chemical compounds to ensure that the required level of disposal has been achieved or that the site does not pose a threat to human health or the environment. The documents must be compiled within 60 days of the completion of the project, and copies kept at one central location where the data shall be available for inspection by authorized representatives of the Environmental Protection Agency and State regulatory agencies. Such documents shall be maintained and accessible to EPA for at least 10 years (one copy to be kept by Detox, and one copy by the applicant).

5. Detox and the applicant shall notify State and local officials in writing of the proposed PCB disposal project. If the project is approved by the Regional Administrator, Detox and the applicant shall notify State and local officials in advance of starting the disposal project.
6. Any PCB container used for PCB transport, storage, or disposal shall not be used for any other purpose unless decontamination of the container complies with 40 CFR 761.79.
7. All PCB articles, equipment, and containers shall be properly marked according to 40 CFR 761.45.
8. Detox and the applicant's personnel safety requirements and procedures for onsite PCB handling, storage, transport, and disposal shall comply with OSHA requirements.
9. The conditions of this authorization are not severable, and if any provisions of this authorization, or any applications of any provision, is held invalid, the remainder of this authorization shall be held to be entirely invalid.

TECHNICAL SUMMARY OF THE DETOX, INC.

BIOLOGICAL PCB DISPOSAL PROCESS

BACKGROUND

On December 17, 1982, Detox, Inc. (formerly "Biotechnology") requested approval from EPA Region VI to dispose of PCBs using its biological degradation process. The process was used in 1981 to treat pentachlorophenol (PCP) contaminated wastes in soil to less than 1 ppm at a site located at Conroe, Texas. The process utilizes a method for acclimating a naturally occurring species of microbes that have a natural tendency for degrading small amounts of PCBs to metabolize PCBs in wastes containing relatively higher PCB concentrations. The microbes metabolize PCBs by attacking the chlorine atoms and ultimately reducing the molecule to cell protoplasm, water, carbon dioxide (aerobic degradation) or methane (anaerobic degradation), and salts. Enzymes are added when necessary to ensure contact between non-soluble PCBs and the microbe. Also, a catalyst is added to increase the rate of the degradation process.

Detox claims PCBs are not toxic to these microbes. It is expected that the higher chlorinated PCBs take longer to degrade than the less chlorinated isomers. Some heavy metals, such as hexavalent chromium, are toxic to the microbes. Each waste material must be examined to determine if the process may be applied. The process cannot be used on wastes containing material toxic to the microbes unless the toxic material is removed. Higher PCB concentrations reportedly require longer time periods than lower concentrations with the same number of microbes because the rate of degradation is constant.

The higher the PCB concentration in a waste, the greater the time required to degrade the waste with the same amount of microbes. The time period for PCB degradation can be shortened by introducing more microbes into the waste. Once the microbes are applied to a PCB waste, continuation of the process is ensured by the presence of sufficient oxygen, moisture, nutrients, and proper pH. Adjustment of pH or the addition of moisture, oxygen or nutrients may be required during the degradation period.

For sludges, aeration may be all that is required depending on the condition of the lagoon (eg., oxygen levels may differ depending on light penetration, depth of the lagoon, temperature, presence of other bacteria, or wind turbulence). For dry waste materials, the surface may require the addition of moisture, or soil may need to be further aerated by loosening the soil surface.

After the source of PCBs is depleted, the microbial population dies out and becomes an energy source for naturally occurring organisms. The process is essentially the same as that used in municipal treatment plants except this process uses microbes that can survive in an otherwise toxic environment.

A proposed decision to approve the Detox process was made on June 1, 1984. A press release was issued opening a 30-day comment period. No comments were received during the comment period.

DEMONSTRATION PROTOCOL FOR ALTERNATE TECHNOLOGIES UNDER 40 CFR 761.60(e)

The PCB regulations require that alternative methods for PCB disposal must be shown capable of achieving a level of performance equivalent to PCB incineration or high efficiency boilers, and that the method does not present an unreasonable risk to human health or the environment. The "level of performance" for alternate technologies has been established as reducing the PCB concentration to below 2 parts per million (ppm). This concentration is generally the state-of-the-art for a quantitative measurement by standard GC-MS analytical techniques. PCB samples containing less than 2 ppm PCBs would be regarded as containing non-detectable PCB concentrations, and the method used to achieve this result would therefore be judged equivalent to the performance of an incinerator. The rationale is discussed in more detail in the October 21, 1983, Federal Register (page 48988) on the Vulcanus I and II draft ocean incineration permit (copy attached).

Alternate technology demonstrations are required to show the ability of the process to reduce the PCB concentration below 2 ppm and to be commercially applicable without risk of injury to human health in the environment. To meet these demonstration requirements, Detox performed a bench scale test and then a field demonstration of its process using PCB contaminated wastes.

DETOX BENCH SCALE DEMONSTRATION

To demonstrate the process, EPA required a bench scale test using a PCB contaminated sludge. The bench test consisted of placing one kilogram samples of PCB contaminated sludge into three, two-liter erlenmeyer flasks. Each flask was sampled for PCB concentration before the addition of microbes and nutrients. The PCB concentration before the introduction of microbes was approximately 150 ppm. Air was bubbled through the samples to maintain aerobic conditions. A florasil trap was placed on the air exhaust line to absorb any PCBs released into the air.

The bench scale test was approved by EPA on February 4, 1983. The test began in March 1983 and was concluded in July 1983. Samples of 100 ml. volume were withdrawn throughout the test period and sent to NUS laboratory located at Houston, Texas for analysis of total PCBs in samples containing sediment and water. The test set-up was inspected by EPA during the test period. Between the period of March 30, 1983 and July 13, 1983, the PCB concentration dropped to less than 1 ppm. Analysis of the florasil trap showed less than 0.5 ug PCBs. Samples of flask #2 were analyzed on 3/30/83, 5/3/83, 5/20/83, 6/3/83, and 7/13/83. Based on the analytical results, the bench scale test demonstrated that the biological process is capable of destroying PCBs to less than 2 ppm without detectable PCB air emissions from the sludge. Also, the gas chromatograms showed no new chlorinated organic compounds formed during the degradation process.

The next phase was to conduct a field test which would demonstrate that the process will work under ambient conditions. On August 8, 1983, Detox submitted a request to conduct a field demonstration. Included was a field demonstration plan that outlined project objectives, scope of work and schedule of performance. The field demonstration was approved by EPA on September 13, 1983, and begun September 22, 1983. The demonstration was concluded in December 1983. It was conducted on the Hearne Utilities property located at Hearne, Texas. The project consisted of placing less than 500 lbs. of PCB contaminated sludge into a non-leaking "bio-reactor" open to ambient air. PCB transformer oil was added to the PCB sludge to raise the total PCB concentration to approximately 2000 ppm. An impellar drive device in the bio-reactor ensured mixing of the sample and that aerobic conditions would be maintained. Microbes and nutrients were added to the reactor after a sample was taken of the material.

EPA was present at the beginning and the end of the test to collect split samples of the sludge before the microbes were introduced into the PCB sludge. EPA observed the test set up to ensure it was in accordance with the test plan, and observed the sample collection by Detox. Samples taken by Detox throughout the test period were hand delivered to NUS laboratories located at Houston, Texas. Detox claimed that chain of custody was maintained in collection and delivery of the samples from Detox to NUS laboratories. The analytical results showed a significant reduction in PCB concentration with final sample results as low as 0.12 ppm.

DISCUSSION OF RESULTS

The Detox demonstration projects showed that the biological PCB disposal method is capable of destroying PCBs to below 2 ppm, and has a practical field application potential without harm to human health or the environment.

Some of the duplicate sample analytical results show a range in PCB concentration. A range in results would be expected when dealing with sediment samples due to non-homogeneous samples, and because of the difficulties inherent in sediment extraction. However, the total picture of the results of the bench and field demonstrations showed a definite trend in the reduction of PCB concentrations in the sludge samples.

The air exhaust sample results in the bench scale test showed no detectable PCBs. This ensured that the reduction in the PCB concentration was not due to air dispersion, and that use of this technology in the field would not result in harm to health or the environment by air dispersion. Ambient air sampling was not conducted at the field demonstration because of the results of the bench scale test, and because the field demonstration did not utilize a heat source which could volatilize the PCBs, or use an air dispersion device for aeration of the sample material which could result in asperation of PCBs.

Copies of the final report were sent to the state agencies for comment on February 27, 1984. The Arkansas Department of Pollution Control and Ecology (ADPC&E) commented that the approval should require site-specific evaluation before granting permission to proceed with PCB disposal. The proposed PCB approval requires a complete report evaluating the site including waste analyses for EPA review. Each potential PCB disposal site would require written approval by the Region VI Regional Administrator before disposal could begin. Due to the wide variety and characteristics of contaminated PCB wastes, it was felt necessary to require site specific approvals to continue to collect more data on the performance of this relatively new technology under different conditions.

CONCLUSION

The bench scale and field tests demonstrated the ability of the Detox biological PCB disposal process to degrade PCBs to below 2 ppm without endangering human health or the environment due to air dispersion, and that the process is adaptable for commercial use.